ary 26, 1859; while, from 1893 to 1900, twenty-seven strong shocks were felt, six of them being of ruinous strength.

Many of these earthquakes were closely connected as regards time with Etnean eruptions. The earthquake of 1805 occurred after, and that of 1859 during, a period of activity. The earthquake of 1865 took place eighty-eight days after the conclusion of a violent eruption; and that of 1911 twenty-two days after the close of the last eruption, which began on September 10 of that year and lasted for twenty-three days. The recent shock occurred about two years and eight months after the end of the same eruption.

The same phenomena seem to characterise all the earthquakes of this district. The disturbed area is small, the intensity of the shock great in its central portion, and the isoseismal lines extremely elongated in form. In some cases the axes of the isoseismal lines are directed towards the central crater; in others (as in the earthquake of 1911) in a perpendicular direction. The small depths of the foci, their situation within the Etnean boundary, the direction of the meizoseismal bands, and the close connection of many of the earthquakes with eruptions of Etna—all these phenomena point clearly to the volcanic origin of the earthquakes, their immediate cause being probably local slips along radial and peripheral fissures.[1]

C. DAVISON.

THE BACHELET LEVITATED RAILWAY.

THE daily Press, or rather a section of it, has been greatly excited during the past week by the exhibition of a model railway, the invention of M. Emile Bachelet, in which a metal carriage is levitated in the air above the rails in a model railway, and then flung forward with very great speed through a series of solenoids. The reporters for the daily Press have discovered new and tremendous possibilities in a scientific principle entirely new to them, but which has been perfectly well known to every electrician and physicist for the last twenty-five years.

The repulsion of a metal plate or ring by an electromagnet or coil carrying an alternating current was discovered independently by Dr. J. A. Fleming and by Prof. Elihu Thomson. In 1887 Dr. Fleming invented and described in the *Electrician* of March 25, 1887, an alternating current galvanometer, in which a copper disk suspended in the interior of a coil carrying an alternating current was repelled and deflected. On June 10, 1887, Prof. Elihu Thomson published in the *Electrician* a lecture on novel phenomena of alternating currents, in which he described the repulsion of copper disks and rings by an alternating electromagnet. Prof. Thomson's apparatus was exhibited at the Paris Exhibition in 1889, and the experiments shown by Prof. Fleming to the Royal Society of Arts in a lecture in May, 1890, and also at a Royal Society *soirée* in the same year, as well as at a Friday evening discourse at the Royal Institution in March, 1891.

Dr. Fleming expounded the whole matter with numerous striking illustrations. Heavy copper rings were made to float in the air, or were shot up into the air with great velocity. This repulsion is due to the repulsion between the currents in the magnet coil and the eddy curents set up by the alternating field in the plate or ring.

The principle was applied by Prof. Elihu Thomson in the invention of an alternating current electric motor, and it has been developed in the well-known compensated repulsion motor of Winter and Eichberg. It is also applied in several forms of rotating and recording electric meter. The phenomena known as "electromagnetic repulsion" are therefore perfectly familiar to electrical engineers, and except in the ingenious application to the support of a model railway carriage there is nothing new. Press reporters and others who have been astonished by the exhibition of this force are merely learning afresh facts which were publicly exhibited and described by Profs. Fleming and Elihu Thomson nearly a quarter of a century ago. Careful experiments and quantitative measurements will, however, be necessary before any valid opinion can be formed whether the principle admits of economical application in the propulsion of real railway trains. Nevertheless M. Bachelet deserves credit for his highly ingenious application of this well-known principle of electromagnetic repulsion.

NOTES.

LORD LAMINGTON, G.C.M.G., G.C.I.E., has consented to be president of the Research Defence Society, in succession to the late Sir David Gill, K.C.B., F.R.S.

ON the recommendation of the council and of the special committee on the Hayden award, the Academy of Natural Sciences of Philadelphia has this year conferred the memorial gold medal on Dr. Henry Fairfield Osborn, in recognition of his distinguished work in vertebrate palæontology.

AT the annual meeting of the Irish Forestry Society on April 23, it was stated by Prof. Campbell that the department hoped to secure 15,000 acres for State forestry in Ireland. A grant had been obtained from the Development Commissioners of 31,430*l*., spread over fifty-two years, for a scheme of forestry in Cork, and the department is applying for a further grant of 45,000*l*. It is thus evident that State forestry in Ireland has broken ground in earnest, and this makes it all the more remarkable that State forestry in England and Scotland should still be waiting to start.

THE sixtieth general meeting of the Institution of Mining Engineers will be held in London, on Thursday, June 4, in the rooms of the Geological Society, under the presidency of Sir William E. Garforth. The following papers will be read, or taken as read:—Sinking and equipment of Blackhall Colliery for the Horden Collieries, Ltd., J. J. Prest and J. Leggat; development of the internal-combustion engine for power generation at collieries, J. Davidson; the geology of the Kent coalfield, Dr. E. A. Newell Arber. In addition, certain papers which have already appeared in the Transactions of the society will be open for discussion.

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[1] M. Baratta, I terremoti d'Italia, 1901, pp. 829–33; A. Riccò, Boll. Soc. Sis. Ital., vol. xvi., 1912, pp. 9–38.

The death is reported, in his seventy-fifth year, of Mr. Newton H. Winchell, State Geologist of Minnesota from 1872 to 1900, and professor of mineralogy at the University of Minnesota from 1873 to 1900. In 1888 he founded the *American Geologist,* which he continued to edit until 1905. He was the author of "Geology of Ohio and Minnesota," "The Iron Ores of Minnesota" (in collaboration with his son, Mr. Horace V. Winchell), "Elements of Optical Mineralogy," and "The Aborigines of Minnesota." Mr. Winchell was three times elected to the presidency of the Minnesota Academy of Sciences, of which he was the founder. Since 1906 he had been archæologist to the Minnesota Historical Society.

The President of the Local Government Board has appointed a Departmental Committee "to consider the present state of the law with regard to the pollution of the air by smoke and other noxious vapours, and its administration, and to advise what steps are desirable and practicable with the view of diminishing the evils still arising from such pollution." The Committee will consist of:—The Right Hon. Russell Rea, M.P., Mr. H. Brevitt, Prof. J. B. Cohen, F.R.S., Colonel H. Hughes, C.B., Mr. J. F. MacCabe, the Right Hon. Lord Newton, Captain H. R. Sankey, Mr. B. Duncomb Sells, Mr. P. C. Simmons, Mr. E. D. Simon, Mr. W. B. Smith, Mr. H. O. Stutchbury, Mr. Christopher Turner, and Sir Aston Webb, C.B. Mr. E. A. Faunch, of the Local Government Board, will act as secretary of the Committee.

In an article published in the *Times* of May 8 attention is directed to the great practical difficulties presented by the problem of the prevention of the spread of sleeping sickness in Uganda, and especially to that of obtaining the cooperation of the natives in carrying out preventive measures. Whatever the chiefs, wishing to stand well with the administration, may profess to believe, there can be no doubt that the native equivalent of "the man in the street" has no faith at all in the assertion of European science that the tsetse-fly is responsible for the spread of the disease; he points to the indisputable fact that the fly was there long before the disease, and he asks why, amongst the many hordes of biting flies, mosquitoes and other insects, should the tsetse alone be blamed? The further fact that the disease did not appear in the country until the Pax Britannica permitted natives to make long journeys in safety, and thus enabled persons infected elsewhere to enter the country, infect the fly, and so start the deadly epidemic, lends colour to the sinister suspicion that the Europeans introduced the disease into the country in order to establish effectually their dominion over its inhabitants. The writer in the *Times* refers to the comparative freedom from natural enemies enjoyed by the adult tsetse-fly, by reason of its alertness and swiftness of flight, but he seems to have forgotten that the insect passes a not inconsiderable period of its existence as a helpless pupa, buried close to the surface of the soil, and therefore much more easily destroyed.

An account of some of the discoveries of expeditions to Peru in 1911–1912 was given by Prof. H. Bingham in Nature of March 26. A new expedition has just started for the same region. As in 1912, the expedition is under the joint auspices of Yale University and the National Geographic Society. Unlike former expeditions, it will cover a period of two years, instead of being confined to one field season. The plan of work will include the making of a topographical map of the region north-west of Cuzco, between the Apurimac and Urubamba rivers; a detailed geographical reconnaissance of the more lofty portions of the mountains, including a study of the large undescribed glaciated region; the establishment of two meteorological stations at different elevations for the taking of systematic records for two years; a study of the distribution and history of food plants of this region; the collection of data respecting the forms and distribution of vertebrates, particularly mammals and reptiles; a survey of the present Indians inhabiting this region, including a study of their dialects, the collection of anthropometric data, and the collection and study of the skeletal remains; an archæological reconnaissance of the entire area, and a continuation of the studies begun by the first expedition, looking toward a geographical interpretation of the Spanish chronicles of the era of discovery and exploration, with particular reference to the identification of ancient place names, the story of Macchu Pichu, and its connection with the history of the Incas.

The issue of the Journal of the Royal Anthropological Institute, July–December, 1913, is largely devoted to the ethnology of Africa. Sir H. H. Johnston contributes a masterly survey of the general question. One of his most important suggestions is that the cattle-keeping communities of the Central Sudan and of Bantu Africa owe much of the slight Caucasian element in their blood and almost all their culture to infiltration from ancient Egypt, rather than to influences from Galaland and Somaliland. In the same connection Prof. Seligmann's elaborate article on some aspects of the Hamitic problem in the Anglo-Egyptian Sudan deserves attention. He supports the suggestion made by Dr. J. G. Frazer in the recent edition of his "Attis, Adonis, Osiris," that the killing of the Shilluk rain-maker or divine king can best be understood in connection with the yearly renascence of vegetation.

The Huxley Memorial Lecture, by Prof. W. J. Sollas, published in the July–December, 1913, issue of the Journal of the Royal Anthropological Institute, is devoted to an account of the exploration of the Paviland Cave at the base of the limestone cliffs of Gower, looking over the waters of the Bristol Channel. It belongs to the Aurignacian period, and the hunters who found shelter there were men of large stature, members of that Crô-Magnon race which occupied during that period the greater part of habitable Europe. They possessed highly developed brains, and had acquired such simple mechanical arts as are essential to primitive man. They had little artistic ability, and have left no recognisable drawings on ivory or bone, the red stripes discovered by Abbé Breuil and Prof. Sollas in the neighbouring cave of Bacon Hole being the only attempts at mural decoration which this race is known to have left behind in Wales. They wore rude ornaments, doubtless exercised some magical arts, and they respected their dead sufficiently to provide for them a ceremonial burial. Whether the Mousterians, their predecessors, occupied this cave is doubtful, nor is it certain that they were followed here by the Solutrians or Magdalenians. Prof. Sollas has thus opened up a new and interesting chapter in the prehistoric archæology of Great Britain.

DURING the last two months excavations have been carried on in a brickfield to the north of Ipswich with the object of discovering and collecting flint implements of probable Lower-Middle Aurignac-Palæolithic age, which are known to occur at a well-marked "occupation level" at varying depths round the sides of the small valley in which the brickfield is situated. Mr. J. Reid Moir informs us that on April 30 digging was commenced at a spot on the south side of this valley, and a section was exposed consisting of 2 ft. of sandy surface material with 2 ft. 3 in. of undisturbed sand below it. At the base of the section the solid London Clay was met with, and on the surface of this clay, under the compact, undisturbed sand many fragments of pottery, calcined flints, and the remains of a hearth were found. A large piece of pottery was found and photographed *in situ*. The pottery was carefully removed, and has been forwarded to the British Museum, Bloomsbury, where it is being examined. It was in an extremely soft and friable condition, contains many fragments of white quartz, and is of a primitive and rudimentary kind.

THE first memoir issued by the South African Institute for Medical Research is an inquiry, by Mr. G. D. Maynard, into the etiology, manifestations and prevention of pneumonia amongst natives on the Rand recruited from tropical areas (published by the institute, Johannesburg, price 5*s*.). Mr. Maynard has availed himself of modern statistical methods and finds, among other interesting results, that the attack and death-rates from pneumonia are influenced by the country of origin of the natives, that the highest attack-rates are found among the gangs which have the lowest physique, and that the prophylactic inoculations with a pneumococcus vaccine appear to reduce the incidence of pneumonia during a limited period. Mr. Maynard's results appear to show that the effect of such immunisation is transitory, the period during which some protection is afforded not exceeding four months, and that little reduction of the case mortality is attained. The paper should be read in conjunction with those of Sir Almroth Wright and his colleagues, who approach the subject from a somewhat different point of view.

WE have been favoured with a separate copy of an illustrated article, by Mr. A. Gallardo, from vol. xxvi. of the *An. Mus. Nac. Hist. Nat. Buenos Aires*, on the new museum of natural history it is proposed to erect in Buenos Aires, for which a considerable amount of money has been voted already. The building, which is to comprise all the essential features of an up-to-date museum, is to be in a modification of the Louis XVI. style, and will comprise a basement, a ground-floor, and a first-floor.

ALTHOUGH isolated mammalian remains of Sarmatian age have been known for some time from the Crimea, it was not till 1908 that a regular deposit of these was discovered, and this, too, in the very heart of Sebastopol itself during certain municipal works. The fauna, a part of which is described by Mr. A. Borissiak, with great wealth of illustration, in the *Mém. Com. Géol. St. Pétersbourg*, ser. 2, livr. lxxxvii., 1914, appears to show indications of affinity with the Pikermi fauna on one hand, and that of the Bugti Hill and Siwaliks on the other. An interesting item is a giraffe-like ruminant, regarded as representing a new genus and species, under the name of *Achtiaria expectans*.

THE fourth part of vol. viii. of Records of the Indian Museum contains seven articles, by as many writers, on the specimens of various groups of, for the most part invertebrate, animals collected during the Abor Expedition of 1911–12. Among these, it must suffice to refer to a preliminary note on certain groups of the Mollusca by Col. Godwin-Austen, who states that the collection as a whole "is one of the finest and most interesting from the eastern frontier I have ever looked over, containing as it does so many genera and new species, and so many that are quite distinct from land Mollusca at present known from the most western part of Assam." Descriptions of two new species appear in this part, and those of others are to follow.

MISSIONARIES and pioneer explorers of equatorial Africa long ago reported the finding of wild oranges and wild lemons; if the fruits were green, they resembled small limes and lemons, but if ripe their sweet flavour caused them to be classed as oranges. The plants yielding this fruit form the subject of an investigation by Mr. W. T. Swingle and Miss Maud Kellerman, of the United States Bureau of Plant Industry, which is published in No. 5 of vol. i. of the *Journal of Agricultural Research*. It is now clear that these plants have been wrongly classed in the Asiatic genus Limonia, and are more closely related to the Citrus; it is proposed to establish a new genus for these African oranges by raising to generic rank the section Citropsis of Engler. A detailed study is given of the different species of this genus. Interesting results have been obtained as regards the grafting and hybridisation of these plants, and an investigation is being made of their possible uses as a fruit. It is probable that Citropsis will show immunity to diseases and adaptations to soil and climate not possessed by the stocks upon which citrous fruits are usually grafted.

THE growing importance of the prickly pear pest in South Africa and Australia has given rise to a search for remedial measures, two of which, the one biological and the other chemical, are described in the March number of the Agricultural Journal of the

Union of South Africa. The first paper, by Dr. Ernest Warren, describes infection experiments with a species of cochineal insect (Green's *Coccus cacti*, var. *ceylonicus*) which showed that, of the two species of prickly pear common in South Africa, the long-spined *Opuntia monocantha* and the small-spined *O. tuna*, only the former succumbed to the attack of the insect, some substance probably being present in the sap of the latter which is injurious to the cochineal insect, since even a wounded surface is not attacked. The second paper, derived from the *Queenslander*, describes a method introduced by Mr. O. C. Roberts, in which treatment consists in the action of arsenious trichloride vapour, at the rate of three quarts of the compound per acre of bush. Up to the present this has only been tested on several hundred acres of land, but the results are said to be sufficiently promising to warrant much more extensive operations in the near future.

STUDENTS of palæobotany will note with pleasure a folio memoir in German on certain fossil calcareous algæ from Japan and China, by Dr. H. Yabe (Sci. Rep. Tôhoku Imp. University, Sendai, Japan, vol. i., No. 1). Only three species are described, but two represent new genera, Metasolenopora and Petrophyton, and the author's well-known care in microscopic details leads to their adequate illustration.

UNDER the title of "Les plus jeunes volcans de la France," Prof. Glangeaud, of Clermont-Ferrand, contributes a well-illustrated account of the chain of the Puys to the *Revue générale des Sciences*, 25e Année (1914), p. 50. The trachytic domes, which are more common in the Mont-d'Or region, are compared with those of the Montagne Pelée and Guadeloupe. Reyer's descriptions of those in Bohemia may provide, however, examples nearer home. A remarkable amount of modern information, including an explanation of the puzzling Puy Chopine, is compressed into this single article.

IN vol. xx. of the *Berichte der naturforschenden Gesellschaft zu Freiburg-im-Breisgau* (1913), W. Deecke discusses the frequent variation in type to be found in European sedimentary rocks of all ages, and concludes that deep marine basins and shallow waters lay side by side, and that the European area always showed, as now, an interlocking of sea and land. Continuous oceanic deposits seem wanting, and the acceptance of this view helps to account for the near association of different sedimentary facies, which other writers have ascribed to the importation of one type over another during lateral thrusting. It may be noted that the author regards the fucoids of the Alpine Flysch, not as algæ or worm-tubes (see NATURE, vol. lxxxv., p. 284), but as sponge-bodies indicative of deep water. In a later paper on "Die Bedeutung salzführender Schichten für tektonische Vorgänge," Deecke ascribes the anomalous position of some of the Alpine masses to gravitational slipping over Triassic strata, from which solution has removed sulphates and chlorides. Such solution takes place easily when the beds are lifted above the usual water-table and are exposed to free percolation, and the author asks for caution before the faulted relation of any overlying mass to its support is ascribed to overthrusting from a distant source. It will be seen that these two papers have a common philosophic aim.

THE Rev. H. V. Gill has sent us a reprint of his paper read at the last meeting of the British Association on the distribution of large earthquakes in time and space. Mr. Gill's theory is that a great mass-displacement of the crust, such as occurs during a violent earthquake, gives rise to a "wobble" or unevenness in the rotation of the earth, which is neutralised by other mass-displacements occurring either in a distant region or regions symmetrically placed along the great circle through the origin, or of displacements in the opposite direction in the neighbourhood of the origin. To test this view, he has examined the distribution of the 889 world-shaking earthquakes recorded by the seismological committee of the British Association. He finds that 674 (or three out of every four) great earthquakes occurred in groups, successive members of which were separated by a week or less, while the remaining 215 were isolated disturbances. Of the former, 163 (or 18·6 per cent. of the whole) belonged to groups of two or more earthquakes occurring at different places symmetrically situated with reference to the origin of the first earthquake of a group; 511 (or 57·1 per cent.) were members of groups occurring at or near the same place. No attempt, however, is made to show that the displacements of individual groups of the latter class occurred in opposite directions.

THE annual report of the Hampstead Scientific Society for 1913 naturally refers with gratification to the favourable reception which was accorded to the publication, "Hampstead Heath: its Geology and Natural History." The membership of the society has attained a "record figure" of 374, with a net increase of thirty for the year. The report contains brief notices of the many valuable papers which have been read to the society, and a summary of the meteorological statistics for the Hampstead Observatory for 1913. "The combination of meteorological circumstances in July was most unusual; coupled with a remarkable cloudiness of eighty-two and an extremely deficient sunshine of only 109 hours were a mean pressure of 30·087 in.—a figure some way in excess of the average—and a rainfall an eighth of an inch below the normal, falling on only eleven days." For the first time, average meteorological data are included in the report; this action marks the fact that the station has been at work for five years. From these preliminary averages it would appear that Hampstead is the coldest, rainiest, snowiest, and frostiest, as well as almost the sunniest and foggiest of the stations in the neighbourhood of London.

THE report of the Royal Prussian Meteorological Institute for the year 1913 (director, Prof. G. Hellmann) exhibits great activity in useful work, relating chiefly to land meteorology and special researches. Arrangements have been made for the preparation of an important work on the climate of Germany, and a special department has been created for the purpose. Among the researches made at the Potsdam Observatory may be mentioned the comparison of different sunshine recorders, and the investigation of unexplained differences which occasionally exist in the indications of ordinary and self-registering rain gauges. The report is accompanied, as in previous years, by several interesting scientific papers. One of these, by Dr. Hellmann, "On the determination of air temperature," bears particularly on the recent discussion on that subject in this country (NATURE, April 9, p. 143). Comparisons of readings in a "Stevenson" screen with those of an aspiration thermometer showed that on a sunny day the temperature by the latter might change more than 1° C. within a minute, while the readings in the screen are not so quickly affected by sudden changes. The results seem to indicate, as was also inferred by Dr. J. Aitken, that the screen readings give trustworthy mean values for short intervals (say two to three minutes); a closer agreement than this in the *time* of observing, as Dr. Hellmann remarks, can scarcely be expected.

A NEW form of Gauss's principle of least constraint forms the subject of a short note by Dr. H. Brell, of Graz, in the Vienna *Sitzungsberichte,* vol. cxxii., p. 7, in which the author obtains a single formula for Appell's equations.

AN addition to the numerous tables of logarithms and anti-logarithms that have been published by various writers for special purposes is the "Table auxiliaire d'Intérêts composés" of M. A. Trignart (Paris: Gauthier-Villars, 1914, price 2 francs). This table gives the various powers of the base, 1·0001, for all integral indices from 1 to 1000, for indices in "thousands" from 1000 to 100,000, and for the ten indices completing the range from 100,000 to 1,000,000. In the first two tables the anti-logarithms to this base are calculated to fifteen decimal places. Those in the third table are given to twenty significant figures. It will be observed that to all intents and purposes these anti-logarithms differ from those of the natural system of logarithms in that the fundamental base differs from unity by 1 in 10,000 instead of by an infinitesimal quantity; at the same time it would appear that a similar difference existed in the case of the original logarithms of Napier. The present table is obviously adapted to meet requirements of a special character, such as might perhaps occur in actuarial computations.

AMONG the reports of recent investigations at the Imperial Institute the first quarterly issue of vol. xii. (1914) of the Bulletin includes papers on the little-known economic products of Somaliland, and on the composition of monazite, which is used extensively in the manufacture of incandescent gas mantles. An illustrated article describes an important plant of rubber-testing machinery set up at the Institute for the purpose of carrying out a systematic investigation of samples of plantation Para rubber specially prepared in Ceylon in different ways, in order to secure accurate data for comparison. A note of agriculture in the Gold Coast states that the cultivation of cocoa is still being extended, and that the crop in 1913 was valued at nearly two and a half millions sterling. The interesting fact, probably not commonly known, is stated that more than one-third of the world's production of cocoa is produced under the British flag.

IN part vi. of the *Verhandlungen* of the German Physical Society Dr. F. A. Lindemann shows how the simple method of dimensions may be applied to the construction of atomic models which shall have many of the properties of the actual atoms. Taking the frequency of the electronic oscillations in such an atom to depend only on the distances between the negative and positive charges, the mass of the carriers of the charges, the force between the charges at unit distance apart, and on Planck's constant h, he shows that if the frequency is proportional to the nth power of the force, it must also be proportional to the $(n-1)$th power of the mass, the $(n-2)$th power of the distance and to the $(1-2n)$th power of h. Taking n in succession equal to 0, 1, and 2, he shows how far the model will represent the behaviour of an actual atom without further hypothesis, and what additional hypotheses must be brought in to reproduce given atomic properties. In this way he arrives at the relations previously given by Balmer, Moseley, Bohr, Gehrcke, and others, as holding for the actual atoms.

THE flow of sand and other fine materials through openings of various shapes and in different circumstances is not a subject which has received much attention from experimentalists, although it is of considerable practical importance We welcome therefore the recent work of Prof. E. A. Hersam, of the University of California, on sands of various degrees of coarseness, on crushed slate, crushed shale, mustard seed, and lead shot. From Prof. Hersam's paper in the April number of the Journal of the Franklin Institute we gather that the following are his principal results. The velocity of flow is determined mainly by the size of the particles and of the opening, but is slightly diminished by angularity of the particles or by moisture on them. The specific gravity of the particles, the height of the material above the opening, and the shape of the upper contour of the material have little effect. If D is the diameter of the opening, d that of the particles, both in inches, the mean velocity of flow V in feet per second is given with sufficient accuracy for most practical purposes by the equation, $V=(D-2d)/\sqrt{D}$.

WE have received a report by Prof. Ph. A. Guye on the unification of the bibliographic abbreviations in chemical memoirs which was presented at the third session of the council of the "Association internationale des Sociétés chimiques," held at the Institut Solvay at Brussels in September, 1913. The author points out the inconvenience which arises from the same periodical being represented by several different abbreviations, and suggests that a uniform system should be adopted by scientific societies and by authors of chemical works. It appears there are only two systematic methods at present in use, namely, those of the International Catalogue of Scientific Literature and of the Concilium Bibliographicum de Zürich. Neither of these lists is complete, but the author is in favour of adopting the system of the International Catalogue, which is under the control of the Regional

Bureaus of twenty-six States and of five societies, and is therefore truly international. The International Catalogue has four regulations for the abbreviation of titles: (*a*) the abbreviated title must be intelligible without a key; (*b*) in the abbreviated title the words, whether entire or abbreviated, must follow each other in the same order as in the original title; (*c*) titles of proceedings, reports, or scientific periodicals in general which are edited or published by learned societies, academies, etc., must, however, begin with the name of the place where the society resides; (*d*) in the case of other periodicals the name of the town where they are edited follows the abbreviated title. The regulations of the Consilium Bibliographicum contain the first two rules of the International Catalogue, but the names of towns are used only when necessary to avoid confusion. It would be a great convenience to readers of chemical works if a uniform system could be adopted, and it is to be hoped that Guye's suggestions will be carried out.

Engineering for May 8 gives particulars of the arrangements made at the Royal Air-craft Factory, Farnborough, for the aeroplane engine competition instituted by the British Government, and now proceeding. The engines are to be of British manufacture throughout (magneto excepted), and in view of the successful performances of British aeroplanes fitted with foreign engines, it is satisfactory to note that there has been a good entry, and that a large number of engines has actually been delivered for test. The test-house has been arranged with six test-beds and friction brakes, each contained in a separate cubicle, and supplied with a wind current of sixty miles an hour. The brakes are the latest pattern of Heenan and Froude's water dynamometer. The War Office proposes to publish a report at the conclusion of the trials.

The new Cunard liner *Aquitania* was towed successfully from the Clydebank yard of Messrs. John Brown and Co., Ltd., to Greenock on Sunday, May 10. After her trial trips this week, she will proceed to Liverpool to be prepared for her maiden voyage to New York on May 30. *Engineering* for May 8 contains an illustrated article dealing with the propelling machinery of this ship. There are twenty-one cylindrical double-ended boilers, each having eight furnaces. The turbine machinery driving the four propeller shafts has been arranged to work on the triple system. The high-pressure ahead turbine, which, along with a high-pressure astern turbine, occupies a separate compartment on the port-wing turbine-room, receives boiler steam direct, which is passed in turn to the intermediate-pressure turbine, occupying, along with a high-pressure astern turbine, a similar compartment on the starboard wing. Two low-pressure ahead turbines on the two inner shafts receive their steam from the intermediate-pressure turbine. Some idea of the enormous size of these turbines may be obtained from the diameter of 15 ft. 4 in. over the tips of the blades of the low-pressure turbine. The combined weight of the low-pressure ahead and astern turbines on one shaft is 445 tons.

OUR ASTRONOMICAL COLUMN.

A Registering Microphotometer.—In 1912 Dr P. Paul Koch described a registering microphotometer designed by himself; the apparatus records photographically the varying intensities of a series of objects such as the lines in a spectrum or a set of interference rings and show their distance apart. The principle involved is to move the negative to be measured slowly in front of an opening through which a beam of light from a constant source is passed, and the resulting changes in the intensity of this light are recorded on a moving photographic plate. Dr. Koch now describes (Contributions from the Mount Wilson Solar Observatory, No. 77) an application of this instrument to the study of certain types of laboratory spectra, and displays in diagrams the resulting curves obtained. Thus, there are types of curves for furnace lines for different temperatures, for lines displaced by pressure, reversed lines, tube-arc lines, etc. While the observations described are stated to be only preliminary and very limited in scope, they are sufficient to indicate the usefulness of the instrument in those branches of spectroscopy in which it is desired to investigate quantitatively measures of line-intensity and structure.

Variable Star Observations.—No. iii. of the Publications of the Vassar College Observatory contains a most useful series of variable star observations made during the period 1901 to 1912, totalling in all 4797 observations. In the publication two points in particular have been aimed at, namely, first to reduce all magnitudes to a uniform standard, that of the Harvard photometry; and secondly, to give the original observations with the exact identification of the companion stars, in order that they may be reduced to any other desired photometric scale. In the introductory remarks, written by the present director, Caroline E. Furness, a detailed account is given of the instruments used, methods of observation employed, etc. Table I., which occupies the greater portion of the publication, gives the details of the observation of each variable; Table II. deals with some photometric observations; Table III. gives the magnitude on the Harvard photometric scale for every tenth grade of the Hagen, while the observed maxima and minima are compared with the ephemeris in Table IV.

Enhanced Manganese Lines and α Andromedæ.—The spectrum of α Andromedæ displays peculiarities which have rendered it difficult to couple it up with other stars in stellar classifications. Both the Harvard and the South Kensington classifications have indicated this star as an anomaly. The lines which are responsible for this peculiarity have now been run to earth by Mr. F. E. Baxandall, and he finds that in the main they are due to a form of manganese known as proto-manganese (Monthly Notices R.A.S., vol. 74, No. iii., p. 250). In his paper, Mr. Baxandall publishes three independent sets of measures of the stellar lines, and he states that while there is no proto manganese line which does not agree in position—within the limits of error in measurement—with an α Andromedæ line, this long succession of close agreements leaves little or no doubt that the two sets are identical. Attention is directed to the interesting fact that while in α Cygni and α Canis Majoris the enhanced lines of iron, chromium, and titanium are strongly shown, and the proto-manganese lines are comparatively weak or lacking, on the other hand, in α Andromedæ the case is the opposite. It will thus be seen that important criteria are being accumulated to help in the task of stellar classification, a former prominent case of another proto-substance being that of chromium in the spectrum of ε Ursæ Majoris shown at South Kensington.